

# 5.3 Bond Enthalpy

## Question Paper

Course	DPIB Chemistry
Section	5. Energetics / Thermochemistry
Topic	5.3 Bond Enthalpy
Difficulty	Easy

**Time allowed:** 40  
**Score:** /33  
**Percentage:** /100

### Question 1a

a)

During chemical reactions, enthalpy changes occur as bonds are broken and formed.

i)

Thermal energy is needed to overcome the attractive forces between atoms. In terms of thermal energy, name the process where bonds are broken.

ii)

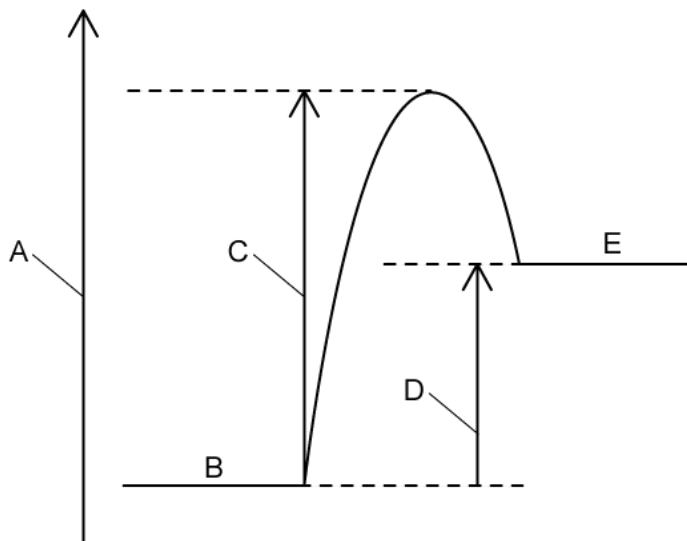
When bonds are formed, thermal energy is released to the surroundings. In terms of thermal energy, name the process where bonds are made.

[2 marks]

### Question 1b

b)

The energy level diagram for an endothermic reaction is shown below.



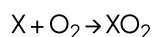
Complete the diagram by labelling parts A to E.

[5 marks]

### Question 1c

c)

An element **X** undergoes complete combustion according to the following equation. The enthalpy change,  $\Delta H$ , and activation energy,  $E_a$ , for this reaction are  $-520 \text{ kJ mol}^{-1}$  and  $+630 \text{ kJ mol}^{-1}$  respectively. Deduce whether this reaction is exothermic or endothermic.



[1 mark]

### Question 1d

d)

Define the term average bond enthalpy.

[2 marks]

### Question 2a

a)

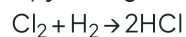
State the formula for calculating the standard enthalpy change of reaction,  $\Delta H_r$ , using bond energies.

[1 mark]

### Question 2b

b)

Use section 11 of the data booklet to calculate the enthalpy change, in  $\text{kJ mol}^{-1}$ , for the following reaction.



[4 marks]

**Question 2c**

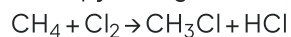
c)

State whether the energy change for the reaction in part (b) is endothermic or exothermic.

[1 mark]

**Question 2d**

d)

Using section 11 of the data booklet, calculate the enthalpy change of reaction,  $\Delta H_r$ , in  $\text{kJ mol}^{-1}$  for the following reaction.

[4 marks]

**Question 3a**

a)

Draw the Lewis structure of an oxygen molecule,  $\text{O}_2$ .

[2 marks]

**Question 3b**

b)  
State the type of energy in the stratosphere responsible for the break down of the oxygen molecule.

[1 mark]

**Question 3c**

c)  
State the equation for the formation of ozone and whether this reaction is endothermic or exothermic.

[2 marks]

**Question 3d**

d)  
State the name of the type of compound that is responsible for the disruption of the temperature regulation in the stratosphere.

[1 mark]

**Question 4a**

a)  
Using displayed formulae, write the equation for the reaction of ethene with water to form ethanol.

[2 marks]

**Question 4b**

b)

Using section 11 in the data booklet calculate the enthalpy change of reaction,  $\Delta H_r$ , for the reaction of ethene with water.

**[4 marks]****Question 4c**

c)

Define *bond dissociation energy*.

**[1 mark]**